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Design Theorizing Individual Information Systems

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DESIGN THEORIZING INDIVIDUAL INFORMATION SYSTEMS

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Abstract

An individual information system is an activity system in which individual persons, according to idiosyncratic needs and preferences, perform processes and activities using information, technology, and other resources to produce informational products and/or services for themselves or others. These small information systems have evolved with increasing complexity around the increasing computing power available to individuals. This paper provides an influence model of premises for theorizing the design activity in these individual systems. The influence model is grounded on previous research related to such systems.

Keywords: Design science, personal systems, individual computing

1 INTRODUCTION

Enabled by the falling costs of information and communications technology (ICT), individual persons and their families are contriving increasingly complex information systems. These systems often involve multiple networked devices that help perform myriad individual information processing tasks. While research into personal usage of ICT has been strong, the most common perspectives fail to recognize that individual persons are operating more than just singular, isolated technologies. These individuals are designing complex systems in which these technologies help process, create, and store individual information.

There may have been, and continue to be, dramatic growth in the populations of such systems. For example, current estimates of the population of Internet users is around 2 billion users with an average annual growth rate of nearly 45% during the 2000 – 2010 period (Miniwatts Marketing Group, 2011). Even if a tiny percentage of these users possess complex systems, then millions of such systems could already exist with an incredible growth potential. These individual information systems are mostly growing and succeeding in ways that are likely to be uninformed by our knowledge of information systems.

In this paper we elaborate the use of information systems theory as a platform for design theorizing in individual information systems. The human process of theorizing operates as a disciplined form of imagination (Weick, 1989). For the purposes of this paper, we examine the potential for information systems to provide the "discipline" in this particular arena of design theorizing. Rather than just build a monolithic design theory, we will theorize the practice by which individuals design their individual systems, and explore the potential role for information systems as grounds for such designing.

To accomplish this purpose, we will first have to define individual information systems. Because these systems may have occupied a blind spot for many IS researchers, we will provide early in the paper an illustrative example (a case) of such systems. We will then consider their historical evolution within the information systems research discipline. Finally, we will formulate the information systems disciplinary ground from which design theorizing may operate on individual information systems.

2 DEFINING INDIVIDUAL INFORMATION SYSTEMS

One central problem looms for any definition for an individual information system (IIS) as a type of information system (IS). Many of the existing definitions of information systems run contrary to the notion that an information system might be the sole property of an individual person. There is a prevailing notion that information systems are a property of organizations, and individually created and owned systems are beyond IS boundaries and "after-hours"(Crowston et al., 2010).

In the IS research discipline, we have typically defined our field in terms of social, organizational, and managerial contexts. Certainly, an IS is something more than its ICT component. Indeed, an IS is more than just ICT *plus* the information that the ICT is processing. Simply appending the human factors to ICT and its concomitant information also seems inadequate. Information systems have long been recognized as complex social-technical phenomena (Bostrom & Heinen, 1977; Mumford & Weir, 1979). These systems are fundamentally a type of human-computer system that positions ICT in a human context.

It is not our purpose here to generate a new definition of an IS. Alter (2008) studied more than 20 different published, widely-varying definitions of information systems. Most include references to computers or technology, and most also refer to organizations in some way. Some mention society or social aspects. Most of these conceptualizations would exclude an individually owned IS. A few definitions ignore ICT, organizations, and society altogether; taking for example a database perspective and thereby admitting individual systems. Alter ultimately defines information systems as a type of "work system", "in which human participants and/or machines perform work (processes and activities) using information, technology, and other resources to produce informational products and/or services for internal or external customers" (p 451). But even Alter's definition complicates

the inclusion of individuals with its reference to internal and external "customers". The choice of the term "work" may be unfortunate for systems that may be wholly or partly dedicated to leisure activities as well as work or professional activities.

Several works in the information science literature have considered "personal" information systems from a database or bibliographic perspective. Such personal IS have been defined as "those systems where an individual collects, annotates, and stores bibliographic information according to his own (idiosyncratic) needs and preferences." (Burton, 1981, p. 440) The idiosyncratic nature of these systems was regarded as important because such personal systems corresponded to unique individuals. This definition was generalized later as a system for the support of personal "collections and personal indexes" (Moon, 1988, p. 265). It has been generalized further as a "personal information system [is one that] provides information tailored to an individual and delivered directly to that individual via a portable, personal information device (PID) such as a personal digital assistant, handheld PC, or a laptop." (Silberschatz & Zdonik, 1996, p. 770)

Integrating these two somewhat contradictory streams of definitions may be tricky, but it is possible. For example, we need to change the notion of work system to something closer to a human activity system (Checkland & Scholes, 1990). An individual information system is an activity system in which individual persons, according to idiosyncratic needs and preferences, perform processes and activities using information, technology, and other resources to produce informational products and/or services for use by themselves or others.

2.1 An Example of an Individual Information System

Many readers will have experience with their own IIS, and may find it surprising to argue that their own personal computer (PC) or laptop should be elevated to the lofty conceptual level of an IS. Before discussing how this form of IS has evolved, we should examine a case of this phenomenon (reported in Baskerville, 2011). Keep in mind that IIS follow idiosyncratic needs and preferences, so no immediate case can be considered typical.

Sam Spade (a pseudonym) is a professional employee in a large government division. Spade has three computers to his personal use: two desktop machines and one laptop. His employer has located one desktop in Spade's office on the employer's premises. Spade owns the other desktop, which is in his home office. Spade's employer also provides a laptop for his personal use. Spade also owns two other laptops he shares with his family. At home, Spade also owns and uses a smart phone, and a combination printer, scanner, and fax machine. All of the devices in his home are networked into a local area network (LAN) that includes a DSL modem, a firewall, an Ethernet router, and a wireless access point. He uses three Internet providers: the DSL connection in his home via a telephone provider, an Internet link to the smart phone via his mobile phone provider, and the connection to his office using his employer's LAN.

Spade has installed more than 50 separate software packages on these computers. His main activities involve only a few of these. The mainstay of his work life is the productivity software package with its spreadsheet, presentations, and especially the word processing tool. He uses this package to generate documents in all facets of his profession. In connection with this tool, he uses accessory writing packages like dictionaries. He also depends on an email package as his main communications medium, and uses a diary/calendar application for planning and record-keeping. He uses a VOIP package for low cost teleconferencing across the Internet. The data related to these major packages are synchronized between PCs, laptops, and his smart phone.

Spade accesses services related to his profession from a cloud provided by his employer. The term cloud is used here in its loose, IS perspective because, in terms of access to services, the cloud is evolving. This notion is broader than cloud computing and extends to cloud-based processes and information systems. This evolution represents the increasing availability of cloud-based business processes as well as low-level data services (Fingar, 2009).

This cloud permits access to many reference resources, such as publications and regulations, much of which is contracted by his employer. The employer-provided cloud also provides online access to

customer and vendor data, online professional tools, and virtual meeting resources. The employer's personnel unit allows Spade online access his personnel and compensation records. Spade also uses a few additional professional services from outside his employer's cloud, including writing aids, discussion groups, meeting planning, and shared file folder drop sites.

In terms of his personal business, a growing cloud of personal finance services is supported by the retail banking, insurance, and financial services industry for individual customers. Spade uses a personal finance package to harvest services from this cloud, and to manage banking accounts and credit cards. He downloads and synchronizes transactions from his accounts for reconciliation with his records. He uses a portfolio package to manage a shares/stock investment portfolio that spans several brokerage and insurance investment accounts. In addition, he uses income tax software to prepare annual tax reports. The tax and personal finance software synchronizes automatically, drawing information from the various clouds. Results are filed directly with the tax authorities across the Internet.

Spade's personal and professional lives overlap where his employee financial transactions touch his personal accounts, as in the case of compensation and expense reimbursement. The overlap extends to travel expenses because Spade does most of his travel planning through airline and hotel booking web sites via the Internet. He often shops online, and while most of his online purchases are personal, he sometimes purchases business related items and claims reimbursement. Such professional expenses go through Spade's personal books further extending the overlap between his employer's IS and his own individual IS.

Spade makes the parts of his IIS that he owns available to his family. Family members share the home LAN for email communications and social networking services. The family also has access to Internet-based films, videos, and television programs that form part of the subscription service from the local cable television provider.

Figure 1 details this individual information system architecture. The architecture in this case demonstrates how this individual's usage of ICT has evolved beyond the boundaries of personal computing or ICT alone. These are simply the bottom two layers that provide the foundation for the information architecture. Here we find work and activity flows, business and personal information processes, and social technical design decisions. These elements form IS problems that are similar to those of large businesses or SMEs. The PC has grown into an IIS that is a genuine IS. Because such IIS architectures are idiosyncratic, other examples would be more complex, and yet others simpler.

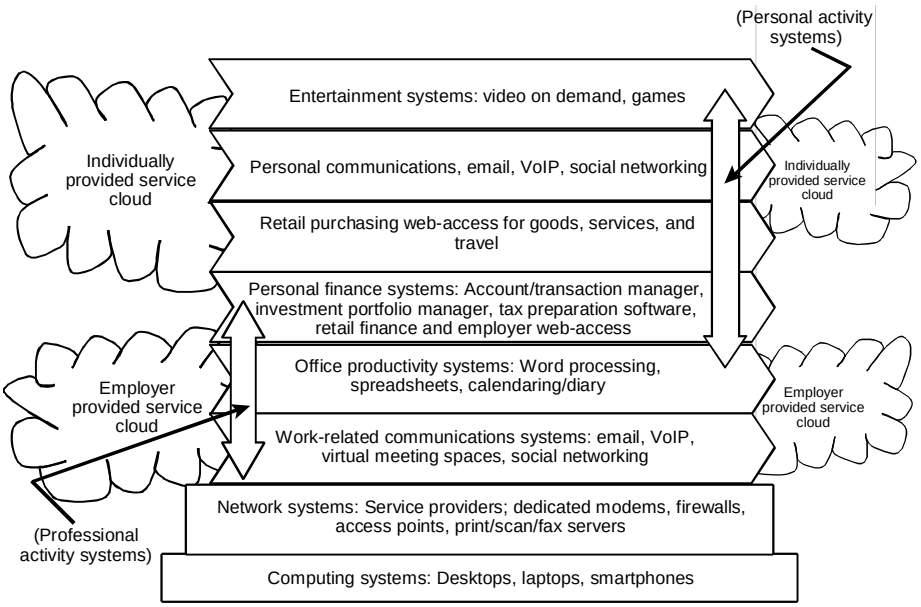

Figure 1. Spade's individual information system architecture (adapted from Baskerville, 2011)

There are two vertical arrows that denote two overlapping activity systems that form subsystems within this IS architecture. The professional activity system corresponds to Spade's information processing activities in his role as an employee. The personal activity system spans Spade's information processing activities outside of his role as an employee. The arrows cut across architectural elements denoting how the distinction between the elements can blur, such as in cases where the employer provides individuals with personal Internet access. The figure also represents how Spade is consuming information services and producing information that arise from, and sinks into, two clouds that do not necessarily overlap. One cloud is generally provided by his employer for use in his professional activities. The other cloud is constructed of services (such as retail financial services) for which Spade contracts individually.

3 RESEARCHING INDIVIDUAL INFORMATION SYSTEMS

To an extent, IIS has evolved without much notice from the IS research discipline. Simple manual systems, like checkbook records, reigned before microcomputer technology brought computing into the home. Some homes had acquired telephones, typewriters, radios, and televisions. Without an IS research discourse about such technologies, these were accepted as "soft and socially neutral" and the embedded social disparities went unnoticed (Claisse & Rowe, 1987, p. 218).

3.1 Personal Computing

The entry of the PC into the home resulted in little further notice by IS researchers. Perhaps this is partly because IS practitioners regarded early home PCs as little more than toys. The desktop PC became interesting only when it began appearing in offices just about the time IS research into office automation recognized the social and organizational implications of personal computing (Hirschheim, 1985). The IS research interest in PCs was largely limited to their role in organizational IS. For example, PCs were interesting because of their role in distributed versus centralized computing architectures, or because they provided a way to automate the organization's more informal IS elements (Lehman, 1985). Personal computing also gained notice because it served as a means for developing IT competence in an organization's managers (Bassellier et al., 2001).

Personal computing was mostly interesting for IS researchers because it provided an end node for data networks. The PC was mostly a smarter and more useful device than dumb terminals, and represented

the technology under the thumbs of end users. PCs were important because these could be applied as components in larger scale computer networks such as grid computing (Taylor, 2006). They also provided a form of ICT that enabled the study of technology diffusion or the societal changes (e.g., the digital divide) implicated by widespread availability of personal computing (Dewan et al., 2010).

3.2 Individuals as Users

The IS focal point on individuals skips past their personal information systems, and mainly focuses on their role in organizational information systems as end users of IS. Individuals are important from this perspective because system usage is a property of the people involved in the system. Such usage is highly individualized, consistent with the defining idiosyncrasy in an IIS. Individuals choose to use, or not to use, information systems for idiosyncratic reasons. For some, reliability is paramount, for others response time is all that matters. Users variously take their (dis) pleasures in uptime, or documentation, or user aids, or scripting capabilities, etc. (Nickerson, 1981)

User adoption studies can be complicated because individual usage is rarely a binary outcome. Individuals may choose to adopt IS at varying levels of sophistication. Some individual users will use one subset of system features; others will choose a different subset. Some will use only the simplest processes, while others will become masters of the most challenging system aspects (Ghorab, 1997). The act of adoption can itself be carried out in idiosyncratic ways. Not surprisingly, a large body of IS research has substituted the individual's intention toward usage rather than attempt to measure usage itself (e.g., Davis, 1989). Intentionality, as opposed to actual behaviour, may be an easier construct to operationalize because of the idiosyncratic nature of adoption itself.

Users have also gained attention from IS researchers because they will sometimes develop or enhance software that makes an IS more complete, or adapts IS functionality to different or better purposes. Forms of such end user development can range from tool-based programming or script development to large-scale IS development projects led by end users instead of IS professionals (Dodd & Carr, 1994). Driven by the social impact of early computer-based automation, IS researchers have also extensively studied user participation in design of organizational information systems (e.g. Kensing, 2003; Mumford, 1983).

Individuals are also important in the design of an IS for more functional reasons. IS researchers have studied the impact of individual task-technology fit on the successful outcomes for IS (Goodhue & Thompson, 1995). This fit is known to drive more objective and instrumental evaluation of an IS by individual users (Goodhue, 1995).

Individuals sometimes appear only in the margins of IS research. Much of the research into teams and virtual teams either marginalizes individual workers or sets up contrasts between team performance and individual performance. For example, for the purposes of team motivation, the availability of individual performance information about team members can degrade overall team performance. Individuals in a team environment will adjust their performance downward when they become aware that others on their team are not putting in an effort. Accordingly, a team information system should be designed to supply only accumulated team level performance information, and keep individual effort hidden from the team (Yoo & Yoon, 2010).

Such studies largely regard the individual as the critical human component in development and deployment of an organizational IS. It assumes the individual is situated more-or-less as an extension of the organizational IS. It is a perspective that views individuals mostly as clients, customers, or consumers of the organization IS (with more-or-less participation). There is comparatively little work that examines an individual's perspective whereby the organization and its IS are an extension of their own individual information system.

3.3 Personal Information Systems

Conceptualization of personal information systems have appeared from various related perspectives. As mentioned earlier, information science recognized early after personal computing began to diffuse that individuals were drawing information from library and database resources, and processing this

information in idiosyncratic ways. These systems were openly subjective in scope and methodology" (Burton, 1981, p. 441). In a similar fashion, personal information systems may become important, strategic, future directions for design of database management systems. The idiosyncratic nature of such systems requires more overhead because of schema and query complexity (Silberschatz & Zdonik, 1996).

The increasing mobility of information devices has also driven perceptions of personal information systems as embodied in handheld devices. This personal usage is of interest from a perspective of both task-technology fit and technology diffusion (Kim, 2009).

Some early IS research recognized that a personal information system can have important impacts on organizational decision makers. Because CEOs acquire more than half of their external strategic information from personal sources, an effective, well-designed personal information system could lead to better organizational strategy-setting (El Sawy, 1985). The design of internal-to-the-organization personal systems could improve decision making at all other levels of an organization. By examining each decision-makers information needs, and taking into account the costs and benefits of addressing such needs, organizations might be able to equip each decision-maker with highly individualized, yet economically sound personal systems (Roof, 1982).

Finally, one point of confusion in the use of terms like "personal information system" or "individual information system" arises from their occasional use in regard to systems that operate on personal data. Such terminology usage may occur in relation to the privacy protection for such data (e.g. Foschio, 1984; Vidmar & Flaherty, 1985).

There are many other perspectives related to individual information systems that are certainly relevant to IIS, but are less well-developed for this purpose than personal computing, end users, and personal information systems. An example is emergent system development approaches, such as agile methodologies, that will prove important foundations for IIS design. Currently, however, such perspectives, like the research discussed above, are generally oriented to individuals as "retail" consumers of various information products and services. In this sense, individuals form a consumer marketplace, for example for computing devices, personal finance software, support services, etc. However, none of the perspectives above land squarely on the issue of the design and management of individual information systems. Like the World-Wide-Web, these individual information systems have grown and succeeded without much in the way of planned management anchored to our knowledge of information systems.

4 ELEMENTS OF DESIGN THEORIZING FOR INDIVIDUAL INFORMATION SYSTEMS

The prior research surveyed here establishes several premises that provide an assumption space for design theorizing in IIS. A fundamental premise is that an information system can serve an individual person's requirements more-or-less exclusively. A second premise is that individual needs and usage of IIS tends to be idiosyncratic. An important corollary to this premise is that individuals maybe uneducated in ICT or information systems. These premises drive two further premises that underlie IIS design theorizing. The socially and geographically bounded retail sourcing for the ICT used in many IIS sets up an important tension in IIS design activities. Lastly, the resource-limited and uneducated IIS designer must learn how to design by experiencing the design activity. Each of these premises is described in more detail in this section.

Underlying these premises are assumptions that design theories can be more concise than the more widely cited views elaborated in the literature (i.e., Gregor & Jones, 2007; Walls et al., 1992). There is a duality in design theories because these include an explanatory part and a practice part (Baskerville & Pries-Heje, 2010). Individuals are largely focused on theorizing the functional explanations for the components they adopt. As a contrast, for example, this paper is developing a practice design theory that focuses on how the designers themselves operate on explanatory design

theories (examples and further details on explanatory design theories are given in Baskerville & Pries-Heje, 2010).

4.1 Information Systems Basis

Individual information systems are distinct from other forms of organizational information systems. Because these systems serve individuals for their personal leisure and/or business information, these differ from those belonging to enterprises or organizations, even SMEs or micro-companies. These systems are oriented to the information needs of an individual and perhaps extend to the individual's home and family.

There are examples of the differences implied by recognition of the IIS. For example, the character of Internet usage is known to be different in household use than it is in business use. There is a higher degree of social and community purposes present for IIS usage (Kraut, 1996). As an activity system, the IIS is likely to serve the social needs of the user, not just the more functional personal business needs (Kraut et al., 1999).

It is very likely that research closely related to users with a human and social perspective can be logically extended to an IIS. For example, concepts like organizational drift (Ciborra & Hanseth, 1999) and double-loop learning (Argyris & Schön, 1978) are anchored to the notions that changes in individuals guide changes in organizations. A logical extension of these concepts suggests changes in the IIS of individuals guide changes in organizational IS. Similarly, the extensive work in human-computer interaction does not generally distinguish systems in an individual sense, although we can logically extend some findings. For example, the common desktop metaphor is questionable as a vehicle for organization individual work (Ravasio et al., 2004) is even less likely to be an ideal information-organization vehicle for the IIS.

Nevertheless, the IIS is a definable form of IS. It is a socio-technical activity system (at the very least, it is socially constructed) that performs processes and activities using information, technology, and other resources to produce informational products and/or services. This trait means that a subset of existing theories about information systems is likely to hold for individual information systems theories. The exact boundaries of the subset are yet to be determined.

4.2 Idiosyncrasy

The IIS is likely to share the idiosyncrasy found by researchers in information science. The nature of the IIS is highly variable in its scope, processes, ICT configuration (Burton, 1981). The values underlying these systems may be surprising. For example, the efficiency and standardization treasured by business IS may be unimportant in the IIS. IIS usage habits may evolve from uneducated use in the context of unlimited system availability (Burton, 1985). Such uneducated use may also drive uneducated design and implementation within the IIS.

On the functional side, the idiosyncratic nature of the IIS complicates our interest in formulating analytical design theories. For example, personal information management has been studied as an activity in which an individual stores and retrieves personal information (documents, e-mail, Web Favourites, tasks, and contacts). Consistent with this idiosyncratic nature, the study showed how an IIS needs to provide for a richer set of subjective attributes in its information management (Bergman et al., 2008).

On the social side, there appears to be more social influence on IIS design decisions. Home computer adoption is driven by utilitarian, hedonistic and social outcomes (value, enjoyment, and status), with reference to friends, family, and co-workers (Venkatesh & Brown, 2001). Indeed, an individual is much more likely to adopt an IIS if the neighbours are doing so (Agarwal et al., 2009). The potential mentality involved in design decisions for the purpose of "keeping up with the Jones" illustrates why design theories in the IIS have to account for the social as well as the functional idiosyncrasy.

4.3 Socio-geographically Bounded ICT

One further important distinction of the IIS is its general dependence on a retail market for ICT that is delimited by the individual's social and geographic horizons (economic geography included). This complex retail acquisition channel more clearly describes the limits on available ICT than 'standardized' ICT, 'preconfigured' ICT, etc. An immense variety of ICT is available through retail channels, but for economic reasons bespoke software and custom hardware are not feasible for IIS. This means that the ICT components for IIS are off-the-shelf. In terms of pricing, it is likely that the IIS may be constructed not just from components that are off-the-shelf, but off the 'bottom' shelf, where cost is lowest. Low-end retail components tend to be less configurable and more standardized to appeal to the broadest possible market segment with the lowest necessary technology education. More so than other forms of information systems, IIS designs are mash-ups by default.

Further, the world's entire retail marketplace is rarely available to individuals in its entirety. The economic limits are joined by physical limits (e.g., the "local" retail market) and social limits formed by the individual's social network. Individual ICT acquisitions are heavily influenced by personal and professional associates, not to mention the influence of shopkeepers, online reviewers, etc.

The bounded ICT sourcing sets up an immediate tension with the idiosyncratic nature of the IIS design and standardized components. While the IIS design has to account for the individual's subjective, even whimsical, needs and methods, it constructs the system using components with more limited versatility. Unless supplied by an employer or other outside principal, such components are likely to be low-end or second-hand devices, freeware, or open-source software. There may even be pirated software or devices of 'shady origin'. These components will often have very limited support adding further tension vis-à-vis the uneducated nature of the individual.

This ICT setting means that the components of the IIS may be assembled and configured in very unusual ways in order to achieve interoperability in the presence of an unusual information process. Under the influence of uneducated designers, the information processing system may involve rather complicated workarounds. For example individuals may routinely uninstall and reinstall software to avoid conflicts or resource limitations; data may be routinely exported and imported multiple times using intermediary software to overcome incompatibility between packages. Such time-consuming workarounds may help explain why process efficiency is less important in IIS.

4.4 Experiential design

Experiential design occurs when the act of design merges together with the experience of the artefact being designed. A simple example is found in the design of a sand castle being built by a child. The design emerges as much from the construction of the artefact as vice versa. Experiential designs are explorable in the sense that they can be tried and changed. For example, software may be available with a trial license (try-before-buy) and retail hardware purchases can usually be returned for refund. The individual can experiment with the design decisions before any final commitment. Experiential design is a concept similar to action learning in that the design outcome is learned by the designer while the design activity is still unfolding. Because of the social and geographic constraints of retail ICT, the requirements of idiosyncrasy, and potentially uneducated designers, IIS design is often a form of experiential design.

Perhaps more than other forms of IS, IIS can emerge as a hodgepodge of components because the complete IIS is rarely replaced entirely. IIS are piecemeal assemblies of components that may have been acquired over periods of time with little thought to the configuration of any ultimate future system. Because new components are added (or substituted) into an existing IIS, the IIS is an emergent product of cumulative elaboration.

Each component acquisition decision may have been rational, or it may have been driven by advertising, impulse, advice from, or mimicry of, other persons (idiosyncrasy). Consequently, IIS are emergent systems in which components acquisition is driven by an immediate context. This immediate context may include the need to solve a new problem as well as the individual's mood, resources, opportunity, and a host of other idiosyncratic variables. This context will also usually

impose certain constraints on the acquisition that are the consequence the past component decisions. In other words, the solution of a new problem may require an elaboration of the IIS through the acquisition of new components that are somehow operable within the existing IIS.

The IIS design activity, informal though it might be, is also likely to be piecemeal. Each design decision elaborates the IIS to provide new properties that have value for a new problem. These properties are "affordances", fundamental properties that determine new uses for the elaborated IIS (Norman, 1988, p. 9). An existing IIS, prior to elaboration, will provide a set of affordances and a set of constraints. After the elaboration, the sets will have changed. The affordances and constraints will be different. Some of the changes will be expected, others will be unexpected. As a result, the designer learns about the design outcome over time, piece by piece. It is an experiential design process.

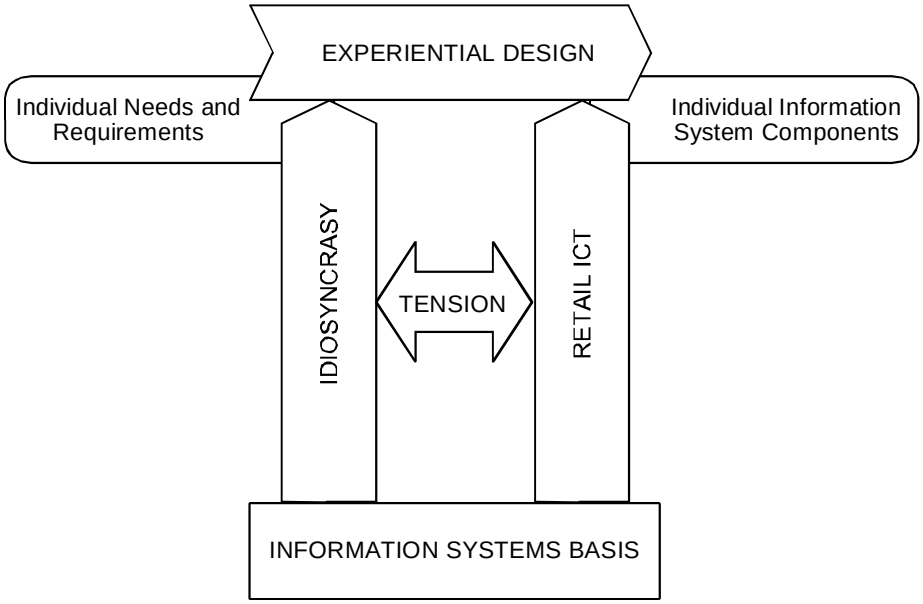

Figure 2. Elements of IIS Design Theorizing.

Figure 2 is an influence representation of these four elements of design theorizing that provide an influence model for the grounding of design theorizing in the IIS arena. Unlike a process model that might have feedback loops, the diagram represents grounds and directions of the influence of the four elements. The foundation of this framework is the IS basis, which draws on relevant theories and knowledge about information systems in general. Anchored to this base are the elements of idiosyncrasy and retail ICT. The tension between these two elements arises from the contradictory natures between the needs/requirements and the available components. Resting atop this tension, a design process is premised to be experiential in IIS design. This means that available components are tried against the individual's needs and requirements using exploration and learning.

This representation provides an interpretation of IIS design that is descriptively consistent with common explanations of design science (e.g., Simon, 1996). It is a form of practice design theory that theorizes the IIS design activity itself. It defers the functionally explanatory part to the individual designer. An explanatory design theory would, at a minimum, establish functional relationships between generalized requirements and generalized solution component (Baskerville & Pries-Heje, 2010). Figure 1 is an example of the components in such an explanatory design theory.

5 DISCUSSION AND CONCLUSION

Well-formed scientific design theories should be generalizable. Many past examples exhibit a duality that includes both explanatory and practice elements (e.g., Kasper, 1996; Walls et al., 1992). Baskerville and Pries-Heje (2010) elaborate explanatory design theories. This paper provides an example of a practice design theory named *experiential design*. While this form of IS design practice is made most obvious in the design of individual information systems, it seems likely that it will generalize to some other instances of cumulative IS design such as emergent systems, agile systems, web systems, etc. Experiential design theory may help us better understand how these designs unfold in practice.

The design theorizing described in this paper opens a variety of future research avenues. As the work provides only a practice design theory, questions open about general explanatory design theories in IIS. These functional explanations may be limited because IIS designs are completely idiosyncratic and may defy all general explanatory design theories. But the phenomena are unexplored at the moment. Future research could explore explanatory design theories for different classes or kinds of IIS. Because these systems are regarded as idiosyncratic, it may be difficult to identify sufficient similarities in such systems to enable usefully general design theories. We may speculate that it may be the case that every IIS design activity will invoke unique explanatory design theories. If such is the case, then design science activity would merge with the design activity beneath it in cases of IIS.

The work described in this paper has not distinguished IIS in terms of distinctions between the individual, the home, or the family. This viewpoint assumes only that the IIS distinct from other information systems encountered by the individual, such as a business, organizational or enterprise IS. Future work is needed to explore how the presence of multiple individual information systems might coexist or merge within a single household. We can speculate that these systems will become tightly integrated such that the IIS is shared seamlessly in a family unit.

Other work is needed to explore the boundaries between that subset of known IS theories that will hold in an IIS, and those that may apply to other forms of information systems, but not to individual information systems. We can speculate that nearly all established information systems theories will apply to an IIS, but this will need extensive empirical investigation.

Further, this paper has provided an information systems viewpoint on the IIS phenomena. It leaves open many avenues for social, psychological, or economic research into IIS. Indeed, Hooker (2004) argues that theories of practice, such as the practice design theory elaborated here, are indistinguishable from the general body of psychological and social behavioural theories. From this viewpoint, this IIS practice design theory is just one of many different pyscho-social abstractions of IIS design behaviour. Further research could better develop the concept of the *individual* as an actor in their own social and cultural IIS context. The influence model sets up this action within a tension between idiosyncrasy and the socio-geographic elements. Other interesting abstractions could be investigated that merge this contradiction and discard the premised tension.

An IIS is a form of IS. It is an activity system based on idiosyncratic needs and preferences of an individual person. Like other forms of IS, it performs processes and activities using ICT and other resources to produce informational products and/or services. While the previous research in IIS is not extensive, it supports four premises that permit a disciplined approach to design theorizing in the area. These premises regard the nature of the IIS as a form of IS and the characteristic tension between idiosyncrasy and the socio-geographically bounded nature of the ICT available. These premises also extend to a form of experiential design in which an uneducated IIS designer can successfully design and implement a system through an exploration and learning process of trial-and error. Together these premises imply that design theorizing in the arena of individual information systems is available, although quite possibly limited to general practice design theories, and more-or-less unique instances of explanatory design theories. In such a case, individual information systems may be an area where design and design science could merge into a single integrated activity.

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